Does gas price impact the marketing duration of residential real estate?

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ABSTRACT

There are many factors considered when a person chooses to buy a home such as size, age and architectural style. Ultimately, a home buyer wishes to maximize amenities and get the most utility at the lowest total cost in the least amount of time. Location plays an important role in most buyers' decision process because of the distance they are willing to travel to work, medical care, or leisure activities. This is the first empirical study to investigate the impact of gas prices on the marketing duration or time on market (TOM) of residential properties outside of the central business district (CBD) for the area studied. The results indicate that rural properties do sustain an increased marketing duration as gasoline prices reach historical levels.

INTRODUCTION

As America's populations have grown so has the need for housing. Exactly how and where home buyers choose to live is a decision involving numerous variables such as school systems, taxes and commute time. However, often, an important criterion in selecting a home is the distance the buyer must travel to work or other primary centers of activity. Home buyers will purchase property in a location where the cost of commuting to work balances the savings they incur from buying a home further away from the employment center for the area (Langer & Winston, 2008). Given that a substantial number of real estate transactions involve a broker[1], home buyers may also be limited to selecting properties that they are shown by their real estate agent. If the agent does not show a buyer certain properties then the buyer may not be aware of them. The increased cost and time requirements of traveling to rural/distant properties make it less likely that these properties will be shown to potential buyers. One attributing factor to larger commuting cost and the likelihood a property is shown may be intensifying gas prices.

This rise in populations and income levels, combined with the relatively low costs of commuting, have allowed cities to expand and develop less dense housing areas (Brueckner, 2001). According to Clawson (1962), Urban sprawl is the "lack of continuity in expansion," or as Ewing (1994) describes it, sprawl is low density development that creates a geographical division between where people live and work. There are many impacts of urban sprawl. Several of the costs that society must bear from urban sprawl include the loss of open space, freeway congestion, long commuting times and the necessary infrastructure that must accompany the housing such as utilities (Brueckner, 2001). However, these costs have done little to deter buyers from continuing to purchase outside of their CBD (Central Business District). Home buyers see

[1] National Association of Realtors survey, 1981

the advantage of getting larger homes and more land at lower prices. Many buyers may not be able to quantify the cost that they must pay because of new infrastructure; the loss of open space, time spent commuting, or pollution resulting from vehicle emissions and energy use. However, the money people spend on gas to be able to commute into the CBD is easily quantifiable. This cost is directly born by the individuals depending on the length of their commute.

In the area studied, 80.1% of the residents live and work within the metropolitan statistical area or MSA being observed, (Virginia Economic Development Partnership, 2009). A majority of the employers and jobs are principally located in the city or urban area. The top five employers, contributing up to 10,000 jobs to the area, and 55% of the total major employers for the MSA are located in the city, (Virginia Economic Development Partnership, 2009). The primary city region, or CBD, of this MSA also offers other amenities that appeal to residents of the region. It contains two of the MSA's three hospitals, or 75% of the area's hospital beds, (Virginia Economic Development Partnership, 2009). This makes the city the primary point of medical care for the region. It also offers a wide variety of shopping and proudly serves as the cultural heart of the region (Virginia Economic Development Partnership, 2009). Geographically, the city is also in the center of the MSA. This makes travel from other parts of the MSA more reasonable and attractive. Because of the major employers, health care providers, leisure opportunities and geographical location, the primary city in this MSA offers an excellent reference point for this study and can be seen as the CBD for the area.

The residents of the MSA being studied have enjoyed the luxury of relatively low fuel costs for many years. As previously mentioned, these low fuel costs have greatly contributed to making travel and commuting long distances feasible for our culture. However, when gas prices have risen, this study shows that the impact on the housing market is quite dramatic. For the purpose

of this study, the properties within the MSA, but outside of the city, are classified as "rural" and closely examined to better understand the outcomes of rising gas prices.

Specifically, we are examining the impact that gas prices have on the marketing duration of rural properties. Due to the higher cost of commuting, we hypothesize that there will be less demand and attention given to rural properties, or the search intensity will decrease, and as a result these properties will remain on the market longer when gas prices trend upward.

LITERATURE REVIEW

The marketing duration of a property has been examined and studied from numerous perspectives. Belkin, Hempel and McLeavey (1976) were one of the first to put forth the theory that the list price and changes to a properties list price directly impact the property's time on market. They also site that market imperfections such as inadequate communication of price changes may impact time of market of properties. Miller (1978) finds a positive relationship between time on market and list price but also notes that a longer marketing duration does not necessarily correlate into a higher sales price. Haurin (1988) has been well cited in the marketing duration literature for his claims that the more atypical a property the longer it will remain on the market and specifically uses unusual location as an example of an atypical characteristic that may negatively impact a properties marketing duration. Kalra and Chang (1994) find that price concessions are the most important variable in determining time on market. However, they also examined macroeconomic factors and found mortgage rates and employment numbers contribute to the explanation of marketing direction of the lower priced housing units.

Yavas and Yang (1995a) find that overpricing homes increases the marketing duration time of mid priced homes but has little impact on lower and upper priced homes. Knight (2002) proposes that homes with larger percentage changes in list price have a longer marketing duration and sell for less. He also suggests that homes with a higher search cost are more likely to have to reduce asking price if the property does not sell quickly.

The impact that a brokerage firm and/or individual agents have on the marketing duration of properties have also been examined in literature. Haurin (1988), Larsen and Park (1989) and Sirmans, Turnbull and Benjamin (1991) all support the idea that larger brokerage firms sell properties more quickly than smaller firms. Contrary to these findings, Jud, Seaks and Winkler (1996) found that individual agent and firm characteristics do not significantly impact time on market and feel that the market is efficient with sharing information and no agents or firms possess notable advantages. Turnbull and Dombrow (2007) present evidence that properties located near other properties listed by the same agent are able to receive a higher sales price. The authors also find that the greater the diversity of listings by an agent, the longer their listings stays on the market. Yang and Yavas (1995) suggest that higher commission rates for agents do not impact the time on market. However, they do suggest that a higher commission rate may signal that the property is more costly to sell because of it location. They specifically cite the example of a rural property being more expensive to show than a property in the city.

In 1980, Halvorsen and Pollakowski examined the impact that volatile gas prices have on home prices. Specifically they analyzed homes that used fuel for heating. They found that fuel prices had a significant impact on home prices, but with lags between fuel prices and corresponding changes in home prices. Specifically, the study compared the prices of homes that used oil heat versus natural gas. Prior to 1973, whether a home used oil or natural gas heating had little

impact on the sales prices of homes. When oil prices rose, and natural gas remained low, houses heated with oil saw decreases in sales price of 16.9%. However, when natural gas prices increased, the sales prices of homes that use oil heat also rose. This market adjustment significantly reduced the sales price differential between homes that used oil or natural gas for heating.

The causes and implications of residential growth away from CBD have been extensively studied in urban development and economic literature. According to Wheaton (1974) and Brueckner (1987) land consumption depends partially upon commuting cost and that the growth of populations, rise in incomes and decline in the cost of commuting has led to the expansion of cities. Gordon and Richardson (2000) suggest a home buyer's desire for larger homes with more land as the reason why many people are looking outside of CBD for housing. Brueckner (2001) identifies three areas where society has failed to fully account for the implications of urban sprawl. The value of open space around cities is discounted, the social costs of freeway congestion is not fully considered, and the total cost of the infrastructure required to support new developments further away from the CBD is not adequately measured. Ostro and Naroff (1980) suggest that in the United States, the increased travel time between home and work is influenced by and simultaneously promotes automobile travel and fuel consumption. Peiser, (1989) agrees with Ostro and Naroff and claims that increased low density development outside of CBD raises transportation costs, consumes large amounts of land, and adds to the cost of providing public services and utilities. In 2001, Brueckner contributed the notion that rising incomes and falling commuter costs have reduced the demand on older city housing, whereby also reducing the incentive for re-development.

DATA

The data for this research consists of observations of residential properties on the market between July 1999 and May 2008 and comes from a multiple listing service (MLS) from south central Virginia. The initial data consists of 21,514 observations. After culling for incomplete, missing or illogical data that suggest data entry errors, the final data set consists of 21,273 observations which are used in the analysis of this paper. There were 13,150 sold properties with the remaining 8,123 either expiring or being withdrawn from the market. A data variable legend is provided in Exhibit 1. The data collected from the MLS include typical property characteristics (square footage, bedrooms and baths), and market and calendar information (location, list dates). The 30-year fixed mortgage rate[2] is used as a measure of economic and market conditions. In addition, gas prices were collected from the Department of Energy records and are an average monthly price per gallon for the state of Virginia (Energy Information Administration, 2009).

Exhibit 1: Variable Legend

Variable	Description
Gas1R	**One if the property was rural and gas prices were between $1 and $2 a gallon, zero otherwise**
Gas2R	**One if the property was rural and gas prices were between $2 and $3 a gallon, zero otherwise**
Gas3R	**One if the property was rural and gas prices were between $3 and $4 a gallon, zero otherwise**
Gasprice	
Rural	**One if the property was located outside of the Lynchburg City limits, zero otherwise**
Vinylsiding	**One if the property had vinyl siding, zero otherwise**
Sqft	**Square footage of property**
Age	**Age of property**

[2] Source: FHLMC or Freddiemac.com

Bedrooms	**Number of bedrooms**
Full baths	**Number of full bathrooms**
Half baths	**Number of half bathrooms**
Garage	**One if the property has a garage, zero otherwise.**
Fire	**One if the property has a fireplace, zero otherwise.**
Brick	**One if the property is of brick construction, zero otherwise.**
Hardwood	**One if the property has hardwood floors, zero otherwise.**
Ceramic	**One if the property has ceramic tile floors, zero otherwise.**
Fullbase	**One if the property has a full basement, zero otherwise.**
Time	**A sequential variable to control for time**
Frmld	**30-year fixed mortgage rate at time of property listing.**
Lt1acre	**One if the property lot size was 1 acre of less, zero otherwise.**
Gt1lt5acres	**One if the property lot size was between 1 and 5 acres, zero otherwise.**
Gt5lt10acres	**One if the property lot size was between 5 and 10 acres, zero otherwise.**
Gt10acres	**One if the property lot size was greater than 10 acres, zero otherwise.**

Descriptive and summary statistics are given in Exhibit 2. The average marketing duration or TOM for properties in the full sample is just over 4 months. The average property has just over 3 bedrooms and 2 full baths. Gasoline prices over the time period studied ranged from a low of just over $.63 cents to just over $3.53 per gallon. Over the time period examined, 9%, 32%, 21.7% and 4.6% of rural properties were on the market for sale during a period where gasoline prices were under $1, between $1-$2, between $2-$3 and over $3 respectively.

Exhibit 2: Summary statistics (full sample)

Variable	Obs	Mean	Std. Dev.	Min	Max
tom	21,273	127.7892	100.954	0	1247
gas1r	21,273	.3206433	.4667348	0	1
gas2r	21,273	.2173567	.4124569	0	1
gas3r	21,273	.0466501	.2108932	0	1

gasprice	21,273	181.4783	73.86995	63.4	353.4
rural	21,273	.6809039	.4661373	0	1
sqft	21,273	1979.419	869.6751	258	9008
age	21,273	27.49838	31.48586	0	470
bedrooms	21,273	3.229687	.8104184	1	8
fullbath	21,273	2.026021	.7220848	1	8
halfbath	21,273	.4152093	.5363261	0	4
garage1	21,273	.3866567	.4869953	0	1
fire1	21,273	.6598059	.4737854	0	1
brick	21,273	.5102443	.4999068	0	1
vinylsiding	21,273	.5114164	.4998814	0	1
hardwood	21,273	.5388438	.4985006	0	1
ceramictile	21,273	.2539735	.4352928	0	1
fullbase	21,273	.5447513	.498005	0	1
time	21,273	25.9277	8.692938	2	40
lt1acre	21,273	.6441465	.4787824	0	1
gt1lt5acres	21,273	.250504	.4333135	0	1
gt5lt10acres	21,273	.0518074	.2216432	0	1
gt10acres	21,273	.0535421	.2251172	0	1

A comparison in the difference of means between sold and unsold properties is shown in exhibit 3. The average TOM for sold properties is significantly less than for those properties that did not sell (110 versus 155). As reflected in exhibit 3, the proportion of rural properties being sold decreases as gasoline prices move upward. Approximately 35% of rural properties sold with gas prices between $1-2 per gallon, only 19% sold when prices were between $2-3 per gallon and just over 3% sold after gasoline topped $3 per gallon. This is in contrast to 28% of rural properties that did not sell when gas prices were between $1-2, 26% when gasoline prices were between $2-3 and almost 7% that did not sell when gasoline prices went above $3 per gallon. The average unsold property is significantly larger based on square footage (2,062 versus 1,928) and bedrooms (3.3 versus 3.2) and significantly older (29 versus 26.5 years).

Exhibit 3: Difference in means (sold versus not sold)

Variable	Obs	Mean	SD	Obs	Mean	SD	t-stat
tom	13,150	110.481	88.824	8,123	155.684	112.437	-30.847
gas1r	13,150	0.347	0.476	8,123	0.278	0.448	10.639
gas2r	13,150	0.192	0.394	8,123	0.258	0.437	-11.027
gas3r	13,150	0.034	0.180	8,123	0.068	0.251	-10.688
gasprice	13,150	174.503	68.794	8,123	192.719	80.123	-17.019
rural	13,150	0.656	0.475	8,123	0.720	0.449	-9.915
sqft	13,150	1928.003	797.233	8,123	2062.283	969.494	-10.506
age	13,150	26.504	28.540	8,123	29.100	35.670	-5.564
bedrooms	13,150	3.197	0.781	8,123	3.283	0.853	-7.437
fullbath	13,150	2.002	0.693	8,123	2.065	0.765	-6.039
halfbath	13,150	0.418	0.532	8,123	0.411	0.543	0.863
garage1	13,150	0.377	0.485	8,123	0.402	0.490	-3.641
fire1	13,150	0.670	0.470	8,123	0.644	0.479	3.928
brick	13,150	0.542	0.498	8,123	0.460	0.498	11.650
vinylsiding	13,150	0.503	0.500	8,123	0.524	0.499	-2.968
hardwood	13,150	0.547	0.498	8,123	0.526	0.499	2.930
ceramictile	13,150	0.244	0.429	8,123	0.271	0.444	-4.361
fullbase	13,150	0.573	0.495	8,123	0.498	0.500	10.692
time	13,150	25.060	8.379	8,123	27.326	9.003	-18.341
lt1acre	13,150	0.685	0.465	8,123	0.579	0.494	15.513
gt1lt5acres	13,150	0.234	0.423	8,123	0.277	0.448	-7.071
gt5lt10acres	13,150	0.045	0.208	8,123	0.062	0.241	-5.155
gt10acres	13,150	0.036	0.187	8,123	0.081	0.274	-13.146

METHODOLOGY

In order to test the impact that certain factors have on the marketing duration of a property, a log-linear regression methodology is employed and given below.

$$\boldsymbol{ln(TOM) = \beta_0 + \beta_i Gas2R + \beta_i Gas3R + \beta_i X_i + \beta_i Y_i + \beta_i Z_i + \varepsilon}$$

Where

LnTOM is the natural logarithm of days on market (TOM).

Gas2R = a dummy variable representing rural properties on the market during periods where gasoline prices were between $2.00 and $3.00 per gallon

Gas3R = a dummy variable representing rural properties on the market during periods where gasoline prices were between $3.00 and $4.00 per gallon.

X = a vector of housing and property characteristics.

Y = a vector of economic characteristics.

Z = a vector of locational and time characteristics.

In indeed, the hypothesis holds, then the expectation is that the estimated coefficient for Gas2R and Gas3R to be positive and significant which will provide support that rural properties are likely to stay on the market longer during periods of increasing gasoline prices.

RESULTS

The results for the entire data sample (sold and unsold) are given in exhibit 4 and are in line with previous marketing duration studies in that larger properties take longer to sell as do older properties and those with larger lot sizes. The rural coefficient is positive as expected however not significant at conventional levels. As seen in exhibit 4, when gas prices are evaluated holding all else constant and looking at all properties, the gasprice coefficient is negative but not significant suggesting that gasoline prices did not significantly impact TOM. The Gas2R coefficient is positive and significant indicating that as gas prices increased in the $2-3 price range, marketing durations increased. Specifically, TOM increases by approximately 15.6% during this time period. Furthermore, an increase of over 8% occurs when gasoline prices break the $3.00 per gallon barrier (see Gas3R in exhibit 4).

Exhibit 4: Regression results (TOM) Full sample (N=21,273)

lntom	Coef.	Std. Err.	t	P>t
gas2r	.1560085	.0198412	7.86	0.000
gas3r	.0809382	.0376288	2.15	0.031
gasprice	-.0000945	.0001887	-0.50	0.617
rural	.0194668	.0157656	1.23	0.217
lnsqft	.1608075	.0287218	5.60	0.000
lnage	-.0850873	.004808	-17.70	0.000
bedrooms	.0129408	.0098344	1.32	0.188
fullbath	-.0371018	.0123653	-3.00	0.003
halfbath	-.0327736	.0120931	-2.71	0.007
garage1	.0053385	.013407	0.40	0.690
fire1	-.0775077	.0140658	-5.51	0.000
brick	-.0645243	.0127241	-5.07	0.000
vinylsiding	-.0207885	.0130407	-1.59	0.111
hardwood	.0240493	.0129437	1.86	0.063
ceramictile	.0321666	.0143318	2.24	0.025
fullbase	-.1259447	.0124679	-10.10	0.000
time	-.0047187	.0013267	-3.56	0.000
lt1acre	-.2563391	.0267839	-9.57	0.000
gt1lt5acres	-.1897221	.0272505	-6.96	0.000
gt5lt10acres	-.1997249	.0348876	-5.72	0.000
_cons	4.075795	.1902106	21.43	0.000

Exhibit 5 illustrates the finding of the marketing duration regression equation for only those residential properties that successfully sold. Similarly as to all marketed properties, sold properties too remain on the market longer during the time gasoline prices are between $2-$3 per gallon. The positive and significant Gas2R coefficient is quite similar to the one shown in exhibit 4 for the entire data sample. However, the findings are more pronounced as gasoline prices venture into the $3.00 per gallon price range as illustrated by the Gas3R coefficient. The

estimated coefficient suggests that properties during this time period will sustain an increased TOM of approximately 23%. The gasoline coefficient is significant and unexpectedly negative, albeit very small. For example, a $1.00 change in gasoline price, holding all else constant, would bring about an insignificant change in TOM. The rural coefficient is positive and marginally significant indicating that rural properties, ceterus paribus, will have a longer marketing duration.

Sold Properties only R-sq = .0543
Exhibit 5: Regression results (TOM) Sold properties (N = 13,150)

lntom	Coef.	Std. Err.	t	P>t
gas2r	.147212	.0246963	5.96	0.000
gas3r	.2289575	.0504516	4.54	0.000
gasprice	-.0007992	.0002415	-3.31	0.001
rural	.0338487	.0180455	1.88	0.061
lnsqft	.1302928	.0361517	3.60	0.000
lnage	-.1051836	.0059007	-17.83	0.000
bedrooms	.0050442	.0121987	0.41	0.679
fullbath	-.0343562	.0154916	-2.22	0.027
halfbath	-.0560314	.0147117	-3.81	0.000
garage1	.0169941	.0162406	1.05	0.295
fire1	-.0755035	.0172942	-4.37	0.000
brick	-.0470545	.0153445	-3.07	0.002
vinylsiding	-.0276521	.0159829	-1.73	0.084
hardwood	.025249	.0157866	1.60	0.110
ceramictile	.0346448	.0173458	2.00	0.046
fullbase	-.1137106	.0150797	-7.54	0.000
time	-.0039847	.0016415	-2.43	0.015
lt1acre	-.1767847	.0383862	-4.61	0.000
gt1lt5acres	-.1390455	.0390182	-3.56	0.000
gt5lt10acres	-.1692255	.0482119	-3.51	0.000
_cons	4.279093	.2397117	17.85	0.000

CONCLUSIONS

The empirical findings outlined in exhibits 4 and 5 provide evidence that rural properties do sustain an increased marketing duration during time of increase gasoline prices. There are several possible reasons why rural properties are so dramatically impacted by rising gas prices. One, when gas prices reach a certain rate home buyers may begin to start factoring in their budgets the increased cost of commuting. Because a home purchase is generally a long term commitment, buyers may be considering the cumulative amount of money they will spend on fuel. They may decide that buying closer to jobs, health care and entertainment will be the most cost effective decision. Because gas prices are not a fixed cost, less risk adverse home buyers may not feel comfortable speculating on what gas prices will do in the future, and may want to avoid a high level of dependency on fuel. This may result in rural properties taking longer to sell. In order for this theory to be valid, Halvorsen and Pollakowski (1980) feel that the market participants must expect gas prices to continue to rise or at the very least not fall lower. The impact the fuel prices have on the market relies heavily on the relationship and difference between current and future fuel prices. If the market anticipates the rates to return to a lower rate, even dramatic escalation in prices will not have a major impact on the market.

The second reason that rural properties may remain on the market longer with increasing gas prices may be the result of actions taken (conscious or unconsciously) by real estate agents or brokers. Most agents act as independent contractors, and as a result are expected to pay for all costs associated with showing properties. This includes gas costs when taking prospective buyers to see homes. In an effort to save money, agents may choose to not show as many rural properties as they might otherwise when gas prices are lower. They may decide to show properties that are closer together and require the least amount of travel time. While buyers may

not be asking to see only properties in the CBD, the agents may be steering customers for self serving reasons to minimize costs. These actions are in essence a decrease in search intensity and as theory predicts, a decrease in search intensity will result in a decrease in the probability of a sale which in turn brings about an increase in TOM.

FOOT NOTES

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